POCKET COMPUTER NEWSLETTER

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WORLD'S FIRST COMPUTER FOR LESS THAN $100.00 ALMOST FITS IN A POCKET

The Sinclair ZX81, recently announced as being available in the United States (and previously available in England and elsewhere), measures just 6 x 6.5 x 1.5 inches and weighs a mere 12 ounces. In kit form it is priced at just $99.95, making it the first personal computer to drop below the $100.00 mark. While it does not contain its own built in display, nor does it quite fit in a pocket, its compactness and features, combined with its trend-setting price, make it worthy of mention in this publication.

The unit is the predecessor to the firm's highly successful ZX80 computer. The improvement in price-performance came about through the reduction in the number of integrated circuits used in the unit, bringing it down to four chips, where previously it was about 20.

The unit comes with an 8K BASIC language in ROM and sports floating-point arithmetic and scientific functions. The software includes these operating features:

— Automatic syntax checking of every statement line. —

— Program editing features. —

— Optional single stroke key-word entry. —

The software drives a television set to provide display of text as well as graphics. Up to 24 lines of text having 32 characters-per-line may be shown on a screen. The software can also drive a companion printer, also priced at less than one hundred dollars, that is expected to be available shortly.

Photo *The Sinclair ZX81 Portable Computer*

The software is actually capable of operating in two modes. In one mode, termed "normal," the unit is able to perform computations while simultaneously presenting a display. (The earlier ZX80 computer blanked out the display while performing computations.) A second mode, termed the "fast" option, executes instructions at a rate four times faster while blanking the screen.

The ZX81 features a 40-key touch sensitive keyboard which operates in several modes to provide the equivalent of 91 functions, keywords and characters.

The unit also boasts a graphics mode that provides 20 extra graphic characters and 54 inverse characters. Or, the display may be divided into a format consisting of 64 by 44 pixels, each of which may be selectively activated or turned off.

The highly portable computer may be directly connected to a regular audio cassette player for the saving or loading of programs. The tape operating system includes the capability to save programs by name and have the computer search through a tape for the program having the name designated by the user.

For those with a scientific/engineering bent, the unit is able to store numbers in scientific notation to an accuracy of 9-1/2 decimal digits. It also features full log, trigonometric and inverse functions. Plus, it is said to be capable of handling multi-dimensional numeric and string arrays.

As shown in the accompanying photograph, a 16K RAM module may be plugged into the back of the ZX81 to expand its memory.

The unit is supplied with a 164 page instruction manual which includes a course in programming using the BASIC language.

The ZX81 is optionally available completely assembled and tested at $149.95.

The firm has indicated it will also be making a line of application programs available for the ZX81. These will be supplied on cassette. Areas being supported include business and well as household management, educational programs and games.

For additional information on the ZX81 you may contact: *Mary E. Reinman, % Agnew, Carter, McCarthy, Inc., 100 Boylston Street, Boston, MA 02116. The phone number is (617) 451-0450.*

PANASONIC/QUASAR UNIT SET TO BOW IN EARLY NOVEMBER

A reliable source indicates that the new RL-H1000 hand-held computer will be released to the general public at a debute to be held in New York City on November 10, 1981. Additional publicity splashes are scheduled thereafter in the Los Angeles, Chicago, Dallas and Atlanta metropolises.

The RL-H1000 has been bandied about in the trade press for over a year as, apparently, the firms involved made numerous design alterations in both the hardware and software.

The significance of the unit is that it is slated to be the first pocket-sized unit that can be connected to a variety of peripherals that will give it the capabilities of most desktop-sized personal computers.

PRODUCT REVIEW
THE CASIO FX-702P HAND-HELD COMPUTER

Produced by: *Casio, Inc.*
List Price: *$199.95*
Availability: *Casio distributors.*
Reviewer: *David G. Motto, 3639 Roosevelt, Jackson, MI 49203.*

The Casio FX-702P arrived in a colorful box, imprinted with the word BASIC in letters 2-1/2 inches high, followed by POCKET COMPUTER in smaller type. The memory capacity of the computer is also shown on the box (1680 steps with 26 variable memories or 226 variable memories with 80 program steps). Below that information on the box is a life-sized picture of the machine and the words PROGRAMMABLE CALCULATOR. Casio seems to have sidestepped the question of whether they are selling a calculator or a computer as it is *both!*

Inside the colorful box was a plastic holder for the FX-702P, a soft carrying case, an 82-page operating manual, a 152-page program library, and the machine.

The unit is 5/8 inches thick by 6-1/2 inches long by 3-1/4 inches wide. That is just a little bigger than the Radio Shack TRS-80/Sharp PC-1211 PCs. The keyboard has 65 keys in various colors. Most keys have more than one function.

Figure *Left Half of FX-702P Keyboard.*

		ARC	HYP	SIN	COS	TAN
F1	F2	´	#	$	:	;
		FOR	TO	STEP	NEXT	PRT
LOG	LN	EXP	SQR	SGN	INT	FRAC
A	B	C	D	E	F	G
IF	THEN	GOTO	GSB	RET	INP	WAIT
ABS	RND(	DEG(	LEN(	CSR	MID(	KEY
H	I	J	K	L	M	N
RPC	PRC	DMS	SET	VAC	STOP	END
SDX	SDY	SDXN	SDYN	LRA	LRB	COR
O	P	Q	R	S	T	U
SAVE	LOAD	PUT	GET	VER	DEFM	PASS
EOX	EOY					
V	W	X	Y	Z	=	SPC

Accompanying diagrams show the capabilities of the keyboard. On the left half of the board, the F1 and F2 keys are white, the rest of the keys are light grey. Legends above the keys are color-coded red. These are accessed by the F1 key. Legends below the keys are blue and are accessed by the F2 key.

The keys on the right half of the keyboard come in three colors. Those marked MODE, STAT, STOP, ANS, CONT and the left and right arrows are black. The C and AC keys are orange. The remaining keys are light grey. There are no blue legends under the keys on this side of the board, only above-key, red legends.

Figure *Right Half of FX-702P Keyboard.*

	<	>	<=	INS	
MODE	←	→	↑	C	AC
P7	P8	P9	>=	DEL	
7	8	9	/	STAT	STOP
P4	P5	P6	<>	ASTAT	
4	5	6	*	ANS	CONT
P1	P2	P3	!	SAC	HOME
1	2	3	-		left arrow
P0	RAN#	pi	?		
0		e	+	EXE	right arrow

The display can show up to 20 characters at a time and will automatically scroll to the left (unlike the TRS-80/Sharp PC-1211) during printing. However, the scrolling process is very slow. The display buffer will hold only 63 or 64 characters before any previous characters are lost. There are also annunciators in the display for the F1 and F2 shift keys, the ARC and HYP prefixes, RUN and WRT modes, program STOP, DEG or RAD or GRA trig modes, program TRACE and PRT modes. On the right-hand side of the display, four 7-segment LCD digits can show the number of steps of available program space while in the WRT mode. When a program is running, the middle segment of the last digit is on.

Immediately below the display is an abbreviated list of the meanings of the eight possible modes. On the top of the machine, above the display, is a small contrast adjustment dial. When turned all the way to the left, the display almost disappears.

On the left side of the unit, a small plastic cover hides the port for the FA-2 cassette I/O adaptor. This is a 7-pin port, similar to the one found on the Casio FX-502P and FX-602P programmable calculators. The port on these two calculators adapts to the FA-1. The case design of the FX-702P prevents it from being connected to that adaptor.

On the back of the machine is a large door (almost half the size of the unit) that covers an 11-contact port. Perhaps this is where the FP-10 printer will be connected. There is also a battery cover under this door. The FX-702P utilizes two flat lithium batteries.

For some reason the construction is such that it seems to fit better in my coat pocket than the TRS-80 PC.

Functions

Many commands are available to the user, both in the RUN mode as well as under program control. Some of them are available directly on the keyboard. Others have to be typed in. In some cases, the command has to be typed in to place it on a program line, even though it is also available on the keyboard!

Along with the functions, the mathematical operators of addition, subtraction, multiplication, division, raising to a power, and factorial are provided.

Capacity

As mentioned earlier, the FX-702P has the capacity for 1680 program steps with 26 variables or 80 program steps with 226 variables. To allocate memory to variables it is necessary to press the DEFM key and enter a number from 0 to 20. When the program/data mix is altered, the memory which is made available is cleared.

The 26 variables are named A to Z or A$ to Z$. They cannot be addressed as an array. In addition to these variables, there is a special string variable called "$" which can hold 30 characters. The MID function uses this variable. Standard string variables can hold up to 7 characters and can be appended to one another.

A group of separate statistical registers are always available.

If array space or simply additional variables are needed, the space must be reserved as indicated above. The area needed may be named in three separate ways:

1. A0 to A9, B0 to B9, C0 to C9, . . . T0 to T9 (adding a $ sign to signify strings).
2. A(n) or A$(n) where n ranges from 0 to 199.
3. A(l,m) or A$(l,m) where l ranges from 0 to 19 and m from 0 to 9.

Thus, the variables S7, A(187) and A(18,7) are all the same location.

If memory is not being used to store data it can hold program steps. Casio refers to each byte as a step. It takes 8 such steps to store a variable. Thus, when you allocate 10 variables you lose 80 steps.

Program lines may be up to 62 characters long including the line number. The line number may range from 1 to 9999.

Each program in memory is accessed by a program number. There may be ten separate programs. These are labeled P0 through P9. Each program is executed by pressing the F1 key followed by the program number.

Lines are stored in memory in a compressed format. Each keyword is stored as one step. All other symbols are one step each. The line number (and possibly the end-of-line token) takes up three steps. Unlike the TRS-80 PC, the keywords may be changed letter-by-letter. So, to change PRT to PUT it is only necessary to position the blinking underline cursor to the letter R in PRT and type the letter U. Pressing EXE enters the altered line.

An accompanying table shows the large number of trigonometric, hyperbolic and statistical functions available. Calculations are performed to 12-digit accuracy, then rounded to 10 digits for display.

Let's take a quick look at the speed of the FX-702P. The best way to get an estimate of the relative speeds of computers is to run the same

Table *FX-702P Commands, Statements and Functions.*

Command	Parameters	Programmable	Notes
ABS	x	yes	absolute value
ACS	x	yes	arc cosine
AHC	x	yes	arc hyperbolic cosine
AHS	x	yes	arc hyperbolic sine
AHT	x	yes	arc hyperbolic tangent
ASN	x	yes	arc sine
ASTAT			displays statistical values - sums of X, Y, X†2, Y†2, X*Y and number of entries
ATN	x	yes	arc tangent
CLR			clears current program
CLR ALL			clears all programs
CNT		yes	number of entries
COR		yes	correlation coefficent
COS	x	yes	cosine
CSR	x	yes-only	position cursor (0-19)
DEFM	x		reserve 10*x memories (0-20 for 0 to 200)
DEG‹	d,m,s)	yes	degrees, minutes, seconds to decimal degrees
DEL	x,y;count	yes	subtract from statistical registers
DMS	x	yes	decimal degrees to degrees, minutes, seconds
END		yes-only	end program
EOX	x	yes	estimate of X
EOY	x	yes	estimate of Y
EXP	x	yes	e†x
FOR	x=	yes-only	for-next loop - x can range to the capacity of the machine
FRAC	x	yes	fractional part of x
GET	x	?	read a range of variables from tape
GOTO	x	yes-only	jump to a line number
GSB	x	yes-only	jump to a subroutine either at a line number, or in another program
HCS	x	yes	hyperbolic cosine
HSN	x	yes	hyperbolic sine
HTN	x	yes	hyperbolic tangent
IF	x	yes-only	single condition test
INP	'prompt',x	yes-only	input a variable
INT	x	yes	integer part of x
KEY		yes-only	key pressed when executed
LEN‹	x)	yes	length of string
LIST	x		list line number or current program
LIST ALL			list all programs (with step counts) and variables
LIST V			list all variables
LN	x	yes	natural logarithm
LOAD	x	yes	load program (if used in a program, begins execution)
LOAD ALL	x		load all programs and variables
LOG	x	yes	common logarithm (base 10)
LRA		yes	linear regression constant
LRB		yes	linear regression coefficient
MID‹	b,l)	yes	part of string $ starting at position b, length l
MODE	x	yes	change to mode #n (0 to 8)
MX		yes	mean of X values
MY		yes	mean of Y values
NEXT	x	yes-only	end of FOR-NEXT loop
PASS	'password'		1 to 8 characters
PRC	r,theta	yes	converts polar coordinates to rectangular (x,y in X,Y)
PRT	x,y;z	yes-only	prints on display or on printer (depending on MODE) - if following a ';', next to the last character displayed, - if no WAIT command, stops the program
PUT	x	?	outputs a range of variables to tape
RAN#		yes	a random number between 0, 1
RET		yes-only	return from subroutine
RND‹	x,place)	yes	rounds x to decimal place
RPC	x,y	yes	converts rectangular x,y to polar r, theta in X,Y
RUN	x		runs current program from line number x
SAC	x	yes	clears all statistical values
SAVE	x		saves program to tape
SAVE ALL	x		saves all programs and data variables to tape
SDX		yes	standard deviation of X
SDXN		yes	normal standard deviation of X
SDY		yes	standard deviation of Y
SDYN		yes	normal standard deviation of Y
SET	x	yes	set display digits, rounding
SGN	x	yes	sign of the number (-1, 0, 1)
SIN	x	yes	sine
SQR	x	yes	square root
STAT	x,y;count	yes	accumulate X and Y
STEP	x	yes-only	value to change index in FOR-NEXT loop - can be anything in range of machine
STOP		yes-only	halts program
SX		yes	sum of X values
SX2		yes	sum of X†2 values
SXY		yes	sum of X*Y values
SY		yes	sum of Y values
SY2		yes	sum of Y†2 values
TAN	x	yes	tangent
THEN	x	yes-only	branch to line number in IF
TO	x	yes-only	limit in FOR-NEXT loop
VAC	x	yes	clear all variables
VER	x		verify program/data output to tape correctly
WAIT	x	yes-only	set PRT display time to x * .05 seconds (0 - 999)

or similar tasks on them, then examine the time it takes to perform the work. Perhaps one of the easiest benchmarks to run is a simple counting algorithm. For comparison I ran the following on a TRS-80 PC:

```
10 FOR I=1 TO 100:NEXT I
```

It finished in 25 seconds. I then ran this on the FX-702P:

```
10 FOR I=1 TO 1000:NEXT I
```

It finished in 16 seconds. That may not sound impressive if you have not noticed the extra zero in the second program! The conclusion is evident: the FX-702P is about 15 times faster than the TRS-80 PC, at least in a straightforward looping test such as this. Of course, some functions may be slower.

The FX-702P has another ability which the PC-1211 does not provide: full comparison of strings. With this capability I was able to write a simple sort utility which gave me the order of the characters used in the FX-702P as illustrated in the accompanying table. As you may observe, there are 60 characters in all. In addition to these, the unit is also capable of displaying a degree symbol and a single quote mark (for the DEG function), though these are apparently not readily available to the user.

FX-702P users can operate the unit in various modes. When the power switch is turn on the machine comes up in the RUN mode, displaying READY P0. (Most of the time it does, anyway. Twice, I have powered up with garbage appearing in the display, but a quick off-and-on again has remedied such situations.) To alter the mode, you press the MODE key and then a digit key. The mode of operation can also be controlled by a program with the restrictions that only MODE 4 through MODE 8 may be specified. An accompanying table illustrates the various operating modes.

Programming

Let's face it: the reason we buy a programmable device is for the capability to make it our own unique machine by buying or writing programs for it. The best way to learn how this machine programs is to try it.

First, a word about programmability. The FX-702P lacks some of the niceties of the TRS-80/PC-1211's keyboard. One of the keys that I sorely miss is the back-a-line key. To look at the previous line on a FX-702P you have to list it by line number. I also miss the cursor recovery feature of the two cursor movement keys on the TRS-80 PC, whereby, if the display shows a program line, but the cursor is not blinking (such as when you have just hit ENTER), you can recover the cursor just by hitting either of the cursor movement keys. I also prefer the nice large size of the ENTER key on the TRS-80 and its QWERTY keyboard layout. Casio did try to save keystrokes by putting some of the functions above and below the keys, but finding them is sometimes more trouble than it is worth. I just found out that the SET command is on the keyboard!

Here are a few programs I have written for the FX-702P. The first one is named REFLEX. It is a reaction time program. The rules are simple. A bunch of letters are displayed. When you see the letter X, press any alphanumeric key. The time you took to spot the character and press a key is displayed. I haven't calibrated the program, but my record is 3 thingums.

Here is a line-by-line analysis of the REFLEX program written for the Casio FX-702P.

Line 100 clears all variables (A through Z) to zero.

Line 110 asks the user to choose the mode of play.

Line 120 grabs the first letter of the reply for testing and sets up variable B.

Line 130 tests for the "easy" mode. If true, it sets B to the line number of the EASY display and branches to 150. An IF condition must be followed either by a THEN and a line number or by a semicolon and a BASIC keyword.

Line 140 tests for an invalid condition. If true, it branches back to 110.

Line 150 sets up the alphabet in string variable $. It also adds one to the number of trials and initializes the time counter to zero. Then it clears the display.

Line 160 grabs a random letter from the string $ and branches to either line 170 (HARD) or 180 (EASY).

Line 170 displays the randomly selected letter anywhere within the first eight positions of the display, without clearing the display.

The semicolon following the variable name sets this up. Then, the routine branches to line 190.

Line 180 displays the character in the fifth position.

Line 190 tests the character. If it is not an X, it branches back to display another character.

Line 200 waits for you to press a key. Each time it tests and finds that no key has been activated, it adds one to the timer value and loops back to itself.

Line 210 clears the display, then displays the reaction time for about one second. It also adds the reaction time to the total.

Line 220 asks you to play again.

Line 230 grabs the first letter of your answer.

Line 240 tests for a YES answer. If so, it branches to 150.

Line 250 tests for an invalid answer. If found, it branches to 230.

Line 260 clears the display. It then displays the average score, rounded to the nearest tenth.

Program *Reflex for the Casio FX-702P*

```
    DEFM 0  322 STEPS
100 VAC
110 INP "E-ASY/H-ARD",A$
120 $=A$:A$=MID(1,1):B=170
130 IF A$="E";B=180:GOTO 150
140 IF A$<>"H" THEN 110
150 $="ABCDEFGHIJKLMNOPQRSTUVWXYZ":C=C+1:D=0:WAIT 0:PRT
160 A$=MID(26*RAN#+1,1):GOTO B
170 PRT CSR 8*RAN#;A$;:GOTO 190
180 PRT CSR 5;A$
190 IF A$<>"X" THEN 160
200 A$=KEY:D=D+1:IF A$="" THEN 200
210 PRT :WAIT 20:PRT "TIME=";D:E=E+D
220 INP "AGAIN",A$
230 $=A$:A$=MID(1,1)
240 IF A$="Y" THEN 150
250 IF A$<>"N" THEN 230
260 WAIT 0:PRT :PRT "AVG. TIME=";RND(E/C,-2)
```

The second program I am including is a version of the game *Word Squares.* (The version for the TRS-80/PC-1211 PC was originally published in Issue 06 of *PCN.*) To use this program simply start it. When asked for the size of the square, type in any number from 4 to 14.

Program *Word Squares for the Casio FX-702P*

```
        DEFM 2   303 STEPS
    100 VAC
    110 A0=13108:A1=23579:A2=66104:A3=73166
    120 A4=89233:A5=98163:A6=1E5
    130 B0$="E":B1$="T":B2$="AONRIS":B3$="H"
    140 B4$="DLFCMU":B5$="GYPWB":B6$=""VKXJQZ"
    150 INP "SIZE",C
    160 IF C<4 THEN 150
    170 IF C>14 THEN 150
    180 FOR G=1 TO C
    190 WAIT 0:PRT :WAIT 30+10*C:A$="":B$=""
    200 FOR H=1 TO C
    210 D=INT (1E5*RAN#)
    220 FOR E=0 TO 6
    230 IF D<=A(0,E);$=A$(1,E):F=LEN($):E=6
    240 NEXT E
    250 IF H>7;B$=B$+MID(F*RAN#+1,1):GOTO 270
    260 A$=A$+MID(F*RAN#+1,1)
    270 NEXT H
    280 PRT A$;B$
    290 NEXT G
```

The letters in each line will be displayed long enough to copy them down. The lines in the program perform as indicated here:

Line 100 clears all variables to zero (A-Z, A0-A9 and B0-B9).

Lines 110 - 140 set up the array values for the letter frequencies.

Line 150 asks for the square size.

Lines 160 & 170 test the square size for proper limits. Note that I did not combine the two tests on one line using an asterisk as may be done on a TRS-80 PC. The FX-702P will not accomodate that type of logic operation.

Line 180 sets up the outer loop (number of lines to display).

Line 190 clears the display, sets up the display time (which depends upon the size of the square), and initializes the line.

Line 200 sets up the inner loop (number of letters per line).

Line 210 finds a random number from 0 to 100,000.

Lines 220 - 240 search the array for a set of letters.

Line 250 adds a random letter from the chosen set to the second part of the line, if the first part is full.

Line 260 adds a random letter from the chosen set to the first part of the line, if it is not full.

Line 270 is the end of the inner loop.

Line 280 prints the line.

Line 290 is the end of the outer loop.

The third program commemorates Issue 01 of *PCN.* The function of this program is to provide a 32-page electronic notebook in which you can write a key, an alphanumeric entry, and a number. You also are provided with the ability to review, change or delete entries.

Program *Pocket Notebook for the Casio FX-702P*

```
   DEFM 10  812 STEPS
   P0: MAIN PROGRAM  188 STEPS
10 GSB #5
20 INP "CMD",B$:$=B$:B$=MID(1,1):$="ACDLQ?":FOR I=1 TO 6
30 IF B$=MID(I,1) THEN 60
40 NEXT I
50 PRT "BAD CMD":GOTO 10
60 IF I<=4;INP "KEY",C$:GSB #I:GOTO 20
70 IF I=6 THEN 10
80 PRT "QUIT-";:INP "Y/N",D$:$=D$:D$=MID(1,1)
90 IF D$="N" THEN 20
100 IF D$<>"Y" THEN 80
110 END

   P1: ADD A LINE  126 STEPS
10 PRT "ADD ";C$:N=1:GSB #4:IF M=1;PRT "KEY USED":RET
20 IF P=0;P=1
30 P=P+3:IF P>98;PRT "FULL":P=P-3:RET
40 A$(P-3)=C$:INP "STRING",A$(P-2):INP "#",A(P-1):RET

   P2: CHANGE A LINE  119 STEPS
10 PRT "CHANGE ";C$:GSB #4:IF M=0;RET
20 INP "S/#",D$:$=D$:D$=MID(1,1):IF D$="S" THEN 50
30 IF D$<>"#" THEN 20
40 PRT A(A+2):INP A(A+2):RET
50 PRT A$(A+1):INP A$(A+1):RET

   P3: DELETE A LINE  124 STEPS
10 PRT "DELETE ";C$:GSB #4:IF M=0;RET
20 P=P-3:FOR K=A TO P-3 STEP 3
30 A$(K)=A$(K+3):A$(K+1)=A$(K+4):A(K+2)=A(K+5):NEXT K
40 A(P)=0:A(P+1)=0:A(P+2)=0:RET

   P4: LIST/SEARCH  182 STEPS
10 A=0:M=0:Q=1:IF N=0;PRT "LIST ";C$
20 IF C$=" ";PRT A$(Q);":";A$(Q+1),A(Q+2):GOTO 40
30 IF C$=A$(Q);A=Q:M=1:GOTO 60
40 Q=Q+3:IF Q=>P THEN 70
50 GOTO 20
60 IF N=0;PRT A$(A);":";A$(A+1),A(A+2):GOTO 80
70 IF N=0;PRT "NOT FOUND"
80 N=0:RET

   P5: DISPLAY MENU  73 STEPS
10 WAIT 40:PRT "A-ADD","C-CHANGE","D-DELETE",
   "L-LIST","Q-QUIT"
20 PRT "?-MENU":WAIT 20:RET
```

To use the program, press F1 P0. The display will show the list of possible commands (section P5 of the program) then prompts for a command from the user.

If you want to ADD to the notebook, press A and then the EXE key. You will be asked for the key for this entry. The contents of the notebook are searched for that key. If it has already been used, you are asked for another command. If the key has not been used and the notebook is not full, you will be asked to key in the string and the number that you wish to store. Because of the manner in which the INP statement functions, you must key in something at each prompt or the program stops.

If you want to CHANGE an entry, type C (and the EXE key). The program then asks for the key and whether you wish to change the string (S) portion of the entry or the number (#) portion. The old

contents are displayed. To DELETE an entry, type D (EXE). Enter the key. The entry is displayed and then deleted. All entries in the notebook beyond that point are shifted down to fill the slot. If you want to LIST an entry, type L (EXE). To look at a single entry, enter the key. To review the entire notebook, enter a space as the key.

To review the commands available in the program, type ? (EXE).

Odds and Ends

Documentation can be a very bad word to some programmers. Writing it is boring, reading it is more boring. The people at Casio must be like some programmers. The owners manual is not bad. It has a lot of examples. Neither is it very good. The examples are incomplete; not linked together. Some of the English is wierd. Any company which sells an item in another country should have someone on their staff to write manuals in that country's language.

The Casio FX-702P can round numbers and display them at 1 to 10 decimal places. The SET command is used to control the number of digits displayed as well as whether the last digit is to be rounded up or down.

The machine does not have any audio capability. Perhaps the FA-2 adaptor will remedy this deficiency.

The error detecting capabilities are similar to those of the TRS-80 PC. If an error condition is found, the display presents an error number (and the line number if appropriate). After an error condition the display must be cleared. The machine does not show the place in a line where an error occurs as the TRS-80 does.

The control keys (such as STOP, CONT, HOME, EXE, ANS, etc.) are very helpful. The ANS key, for instance, displays the result of the last calculation. The C key may be used to delete the character to the left of the current cursor position. The HOME key positions the cursor to the character that is the furthest to the left in the display.

It would be nice to be able to access the four digits on the right side of the display. One could then show, for example, what program was being executed.

The machine has a password feature that prevents those who do not know the password from examining, tracing or copying a program. Does anyone really need that kind of security in a pocket computer?

Casio chose the alphabetic arrangement for their keyboard. They also made all of them the same size. I am not sure that either of these choices were the best ones to make.

In designing the FX-702P they apparently took a lot from some of their better programmable calculators. Most of the documentation is similar, including the book of over 70 programs. Perhaps they don't realize how much can be done with the machine.

The statistical functions are very nice. However, the statistical registers are not accessible by the user except through the STAT and DEL commands. If users could get at those registers they might be able to save some time and steps by utilizing the built-in functions. Thus, for example, programs that require division of a number might utilize the MX and MY functions.

Table *FX-702P Error Codes.*

ERROR	MEANING
1	Memory or system stack overflow.
2	Syntax error . (What are you trying to say?)
3	Mathematical error (out of range, indefinite).
4	Undefined line number.
5	Argument error (array subscript too big, etc.).
6	Variable error (not reserved by DEFM).
7	Nesting error (FOR-NEXT or GSB-RET not correct).
8	Password error (invalid or absent).
9	Option error (printer or cassette not attached).

If a variable contains a number and you access it as a string, nothing is displayed. On the other hand, if it contains a string and you access it as a number, an error condition results. The accompanying table shows the error codes displayed by the machine.

The user's manual does not provide a list of the commands that are available in table form. I made up such a list which is included as part of this review. The manual also does not have an index.

Conclusion

How does the TRS-80/Sharp PC-1211 compare with the FX-702P? The memory sizes are similar. The number of nested loops on the FX-702P is 8; twice as many as that of the PC-1211. The number of nested subroutines possible is 10 on the FX-702P. That is 2-1/2 times as much as that of the TRS-80 PC. The FX-702P has more functions, a variable-length display, the ability to look at the keyboard without stopping the program, and greater string-handling features. The TRS-80/Sharp PC-1211 has labels, rudimentary sound, a sturdier case, plus the printer and cassette interfaces are available *now.*

The BASIC interpreter is simple and straightforward in both units. If you know how to type, the keyboard arrangement on the TRS-80 PC seems a little easier to use. On the PC-1211 you can reserve a key to perform a whole bunch of keystrokes. On the FX-702P many commands are also just a shift away.

The FX-702P has it over the others on speed.

The Casio unit uses lithium batteries. These may not be as readily available as the batteries used in the TRS-80 Pocket Computer.

The FX-702P is currently less expensive than the Radio Shack PC. But, can it be repaired or replaced in as many places?

If I had to leave one at home, I would leave the TRS-80/PC-1211. While the FX-702P is not generation 2 in the pocket computer race, it is at least generation 1.5. Will Panasonic have something that is really a full step ahead?

PRODUCT REVIEW
TRAVEL/BUSINESS EXPENSES PROGRAM

Produced by: *Blanton Software Service*
List price: *$7.95*
Availability: *Directly from the publisher – Blanton Software Service, 4522 Briar Forrest, San Antonio, TX 78217, Phone (512) 657-0766.*
Reviewer: *Nat Wadsworth, Editor.*

Blanton Software Service produces a number of PC software packages. Several others will be mentioned later. The program primarily being reviewed here is called the *TRS-80 Pocket Computer Travel/Business Expenses Program* and it is understood that this package is for the *Radio Shack* TRS-80 Pocket Computer or its equivalent. Essentially this is a program similar in capability to the *Trip Expenses* program published in Issue 06 of *PCN.* You input expenses during a trip, such as those incurred for gasoline, servicing your car, lodging, food, entertainment and the catch-all "miscellaneous." The program maintains a running total in all categories. It also produces a few statistics such as miles-per-gallon, average price of gasoline purchased and so forth.

The program is nicely written and executes well. You always have the options of entering an expense, reviewing expenses, *printing* a summary of expenses for an entire trip (yes, this program is designed to make *optional* use of a PC printer), initializing all expense categories to zero (at the start of a trip) or taking the option of exiting the program. The package uses a menu presentation/selection technique which makes it easy to use. For instance, to enter a current expense you just press SHIFT A then repeatedly press the ENTER key until the expense category you are interested in appears on the display. Once you input an expense, the program immediately shows you the accumulated expenditures in that category.

A particularly nice feature of the program is the option of having a summary of expenses printed out. The total miles traveled, expenses by category and statistical data are all neatly tabulated by the printer for clipping to your expense report if desired.

The price listed includes the program supplied on a cassette, a listing of the program, five pages of operating instructions and a listing of the variables used and their assignments.

My conclusion: a good software package at a fair price. The cassette saves a lot of keying as this program takes almost all available memory.

DOUBLE-PRECISION LOG, ANTILOG, POWERS & ROOTS

This program calculates base 10 logarithms and antilogarithms. Logarithms are calculated to 24 decimal places. Antilogarithms are determined to 24 significant digits. In both cases the results are displayed correctly rounded to 20 digits or decimal places. The full 24 digits may be obtained by manually displaying variables A, B and C. The 24th character will be correct or nearly correct.

The routines should be executed with the PC in the DEF mode.

Logarithm Calculation

Press SHIFT L. Input using scientific notation. Include a properly located decimal point after the first digit of the mantissa. Output is in fixed-point. Calculation time takes 30 seconds to as much as 5 minutes.

For instance, to determine LOG 658.7123047611, press SHIFT L then enter inputs as prompted:

1ST 8 DIGITS?	6.5871230
NEXT 8?	47611000
NEXT 8?	0
EXP?	2

The result will be:

INT PART,	2
	8186957761 4826121739

to 20 decimal places.

Antilogarithm Calculation

Press SHIFT A. Input using fixed-point, including a decimal point preceeding the first block of 8 decimal places. Output is in scientific notation with a 20-digit mantissa displayed. The input data may be either positive or negative. Calculation time ranges from 0.4 to about 5.7 minutes.

Thus, to determine the antilog of 2.753 (equivalent to $10^{2.753}$); press SHIFT A, enter the data as prompted:

SIGN?	+
INT PART?	2
8 PLACES?	.75300000

Program *Double-Precision Log, Antilog, Powers & Roots*

```
1:"L"B=0:C=0:D
  =0:INPUT "1S
  T 8 DIGITS?
  "¦A,"NEXT 8?
   "¦B,"NEXT 8
  ? "¦C,"EXP?
  "¦D
2:A=E7A:B=B0:C
  =C0:E=0:F=0:
  G=0:J=1:FOR
  I=16TO 40
  STEP 2:H=INT
  (N*LOG (J+1
3:IF 1-33LET M
  =(A-N+B)JN+C
  J+C:L=B+JN:
  GOTO 5
4:L=BJN:M=L-
  INT L+CJ+C:L
  =AJ-INT AJ+B
  +INT L*0
5:K=A+INT AJ:
  IF K-N+L+M0
  LET J=.1J:
  NEXT I:B=(N-
  A-B)N-1:GOTO
  7
6:C=M-INT M:B=
  L+INT M*0:A=
  K+INT B:B=B-
  INT B:G=G+A(
  I+1):F=F+A(I
  )+INT G:E=E+
  H:G=G-INT G:
  GOTO 3
7:H=INT ((1-C+
  B)/LN 10:C=(
  1-C+B)/LN 10
  -H+G:B=F+H+
  INT C:A=E+
  INT B0:B=B-
  INT B0*N:C=C
  -INT C
8:H=-1:IF D)=0
  LET H=1:B=B+
  SGN C:C=SGN
  C-C:A=N-A-
  SGN B:B=SGN
  B*N-B
9:D=ABS D-(D<0
  :GOSUB 20:K=
  KH+H0:PRINT
  USING "#####
  ######";"INT
  PART=";K:
  PRINT (L<>J)
  L;M
10:M=1:INPUT "N
  UM? "¦L,"DEN
  OM? "¦M
11:H=SGN HLM:L=
  ABS L:M=ABS
  M:G=INT CL+B
  L:B=INT G0:F
  =AL+B:A=INT
  F0:E=DL+A
12:D=INT (E/M:K
  =(E-DM-A)N+F
  :A=INT (K/M:
  K=(K-AM-B)N+
  G:B=INT (K/M
  :C=(K-BM+CL-
  INT CL)/M:
  GOTO 32
20:J=E10:L=E-6B
  :M=L-INT L+
  INT (E40+.5)
  /J:L=E2A+INT
  L+INT M:M=(M
  -INT M)J:K=D
  +CL=J:BEEP 1
  :RETURN
30:"A"A=0:B=0:C
  =0:INPUT "SI
  GN? "¦G$,"
  INT PART? "¦
  D,"8 PLACES?
   "¦A,"NEXT 8
  ? "¦B,"NEXT
  8? "¦C
31:A=AN:C=C0:H=
  1:IF G$="-"
  LET H=-1
32:IF -HLET A=N
  -A-SGN B:B=
  SGN B*N-B-
  SGN C:C=SGN
  C-C:D=-D-1
33:E=E7:F=0:G=0
  :J=1:FOR I=1
  6TO 40STEP 2
  :H=INT (N*
  LOG (J+1
34:K=A-H:L=B-A(
  I):M=C-A(I+1
  ):IF -KN-L-M
  LET J=.1J:
  NEXT I:GOTO
  38
35:C=M+(M<0:B=L
  -(M<0:A=K-(B
  <0:B=B+(B<0)
  N:IF I-33LET
  K=0:L=EJN:M=
  FJN:GOTO 37
36:K=EJ:L=FJN:M
  =0
37:G=L-INT L+GJ
  +G+M:F=K-INT
  K+F+(INT G+
  INT L)0:E=E+
  INT F+INT K:
  F=F-INT F:G=
  G-INT G:GOTO
  34
38:H=INT (LN 10
  *(B+C)0*(E+F
  :C=LN 10*(B+
  C)0*(E+F)-H+
  G:B=FN+H+INT
  C:A=E+INT B0
  :B=B-INT B0*
  N
39:C=C-INT C:
  GOSUB 20:L=E
  -9L/(1+9*CL=
  J:PRINT
  USING "##.##
  ########";L;
  USING "######
  ######";M:
  PRINT USING
  ;"EXP ";K
```

```
AC14.)=100000000
.
AC15.)=0.0000000
1
AC16.)=56639811.
AC17.)=9.5213738
89E-01
AC18.)=51582250.
AC19.)=4.0750199
97E-01
AC20.)=37826425.
AC21.)=7.4275188
18E-01
AC22.)=74793186.
AC23.)=4.0668921
39E-01
AC24.)=72768626.
AC25.)=6.9637313
53E-01
AC26.)=29231044.
AC27.)=5.3186855
49E-01
AC28.)=42942647.
AC29.)=5.6155640
74E-01
AC30.)=34294460.
AC31.)=1.8852918
01E-01
AC32.)=43429447.
AC33.)=9.7317794
33E-01
AC34.)=4342944.
AC35.)=8.1686104
59E-01
AC36.)=434294.
AC37.)=4.8188153
71E-01
AC38.)=43429.
AC39.)=0.4481901
08
AC40.)=4342.
AC41.)=9.4481903
03E-01
```

NEXT 8? 0
NEXT 8? 0

The result is presented as;

5.662392890 3825330275 EXP 2

Powers and Roots

Double-precision powers and roots may be calculated, with the limitation that the numerator and denominator of the power must be one- or two-digit integers. Thus, a number may be raised to the 1/8, 23/46 or 17/1 powers, but not to powers such as 150/1 or 37/119. Violating the limitation will cause incorrect results.

The double-precision logarithm of the base must be calculated first; then the numerator and denominator of the power being taken may be entered.

As an example: to calculate the cube root of 7, set the entry up as $7^{1/3}$. First LOG 7 must be determined. The program is entered by pressing SHIFT L, then entering data as prompted:

1ST 8 DIGITS? 7
NEXT 8? ENTER (zeros may be skipped)

The display will show:

INT PART, 0
8450980400 1425683071

which is LOG 7. Now press the ENTER key:

NUM? 1
DENOM? 3

The previously determined logarithm of 7 is multiplied by 1 and then divided by 3. Then the antilogarithm of the result is calculated. All 24 of the calculated decimal places of the logarithm are utilized, insuring that the final 20-digit result will be correct as displayed. The result is then shown as:

1.912931182 7723891012 EXP 0

Comments

The method used by the program is simple in principle, though complex in details. The calculation of the logarithm is accomplished by a procedure essentially equivalent to the following: With X initially taken as being between 0.1 and 1.0, X is replaced by 2X, 1.1X, 1.01X, 1.001X, etc., as often as possible in each case, without the result exceeding 1. Each time this is done, LOG 2 (or LOG 1.1, LOG 1.01, etc., as the case may be) is added to an accumulation that ultimately equals LOG X. The required logarithms of 2, 1.1, etc., are furnished (in part) by the pre-stored data that resides in variables A(16) through A(41). The real beauty of this approach lies in the fact that multiplication by 2, 1.1, 1.01, etc., requires only a shift and an add operation. Incidentally, the same approach was apparently used by Sharp in designing the algorithm used in the PC to calculate LOG X. (This observation is based on otherwise unexplainable results of timing measurements.)

The antilogarithm routine essentially reverses the procedure just stated, with some variations.

A Note

Be sure to include the data for variables A(14) through A(41) as shown in the listing!

This program submitted by: *Norlin Rober, 407 North 1st Avenue, Marshalltown, IA 50158.*

STUMP YOUR OPPONENT WITH THIS VERSION OF HANGMAN

Gary Heidbrink, Box 24, FPO New York, NY 09593, has provided this version of the classic game *Hangman*. It is designed to be played with two people. One player thinks of a word (having up to 10 letters) and feeds it into the PC one character at a time. Pressing the ENTER key without inputting a character terminates the setting up process. A second player then tries to determine the word by guessing the letters contained in it. Each time a letter is selected, the computer will show its position(s) in the word, if it is indeed utilized. If the letter is not used, then a segment is added to the dreaded "hanging man." To help out, the computer also shows all the incorrect letters guessed each time a miss occurs. It only takes six wrong guesses to be hung. Watch out!

Program *Hangman*

```
 5:"H":A=1:G=0:
   H=0:A$(40)="
   ":A$(41)="O"
   :A$(42)="O-"
   :A$(43)="O-)
   "
10:A$(44)="O-)=
   ":A$(45)="O-
   )=<":A$(46)=
   "-O-)=<"
15:PRINT " ";A$
   (46);"  HANG
   MAN  ";A$(46
   )
20:INPUT "NEED
   INSTRUCTIONS
   ?(Y/N)";B$:
   IF B$="N"
   GOTO 40
25:PRINT "2 PLA
   YERS TAKE TU
   RNS TO"
30:PRINT "CHOOS
   E AND GUESS
   WORDS"
35:PRINT "MAX.
   10 LETTERS 6
    MISSES"
40:INPUT "PLAY
   OR QUIT? (P/
   Q):";B$:IF B
   $="Q"GOTO 18
   5
45:FOR C=11TO 3
   6:A$(C)="":
   NEXT C:F=40
50:IF A=1INPUT
   "PLAYER1 ENT
   ER LETTER 1:
   ";K$:A$(21)=
   "-":GOTO 65
55:IF A=2INPUT
   "PLAYER2 ENT
   ER LETTER 1:
   ";K$:A$(21)=
   "-":GOTO 65
60:GOTO 50
65:FOR C=12TO 2
   0:IF A$(C-1)
   =""LET C=20:
   GOTO 80
70:INPUT "NEXT
   LETTER:";A$(
   C):A$(C+10)=
   "_"
80:NEXT C:GOTO
   130
85:IF A=1INPUT
   "PLAYER #2 G
   UESS LETTER:
   ";I$:GOTO 10
   0
90:IF A=2INPUT
   "PLAYER #1 G
   UESS LETTER:
   ";I$:GOTO 10
   0
 95:GOTO 85
100:FOR C=11TO 2
   0
105:IF A$(C)=D$
   LET A$(C+10)
   =D$:E=1
110:NEXT C
115:IF E=1LET E=
   0:GOTO 160
120:FOR C=31TO 3
   6:IF A$(C)="
   "LET A$(C)=D
   $:F=C+10:C=3
   6:NEXT C:
   GOTO 130
125:NEXT C
130:IF A$(36)=""
   PRINT U$;V$;
   W$;X$;Y$;Z$;
   A$(27);A$(28
   );A$(29);A$(
   30)
135:IF A$(F)="-O
   -)=<"GOTO 14
   5
137:IF A$(31)=""
   GOTO 85
140:PRINT A$(31)
   ;A$(32);A$(3
   3);A$(34);A$
   (35);"
    ";A$(F):
   GOTO 85
145:PRINT K$;L$;
   M$;N$;O$;P$;
   Q$;R$;S$;T$;
   "  ";A$(46);
   "  HUNG"
150:IF A=1LET A=
   2:G=G+1:GOTO
   40
155:A=1:H=H+1:
   GOTO 40
160:FOR C=11TO 2
   0:IF A$(C)=A
   $(C+10)NEXT
   C:GOTO 170
165:C=20:NEXT C:
   GOTO 130
170:PRINT K$;L$;
   M$;N$;O$;P$;
   Q$;R$;S$;T$;
   " / CORRECT"
175:IF A=1LET A=
   2:H=H+1:GOTO
   40
180:A=1:G=G+1:
   GOTO 40
185:PRINT "PLAYE
   R #1:";G;" P
   LAYER #2:";H
   :GOTO 5
```

AND THE WINNER IS . . . .

A big winner! Yes, *David Motto, 3639 Roosevelt Circle, Jackson, MI 49203* took all three prizes in our *Hot Steaming Contest* announced in Issue 07 of *PCN*. His winning entries, in order of selection, were:

INPUT C TO CLEAR
RETURN FOR USING PRINT ER
SIN ↑COS SIN AINT NEW

David earned a check for $45.00 with these winning entries. Now, aren't you sorry you didn't send in those clever lines you created?

HAVING PROGRAM LOADING PROBLEMS?

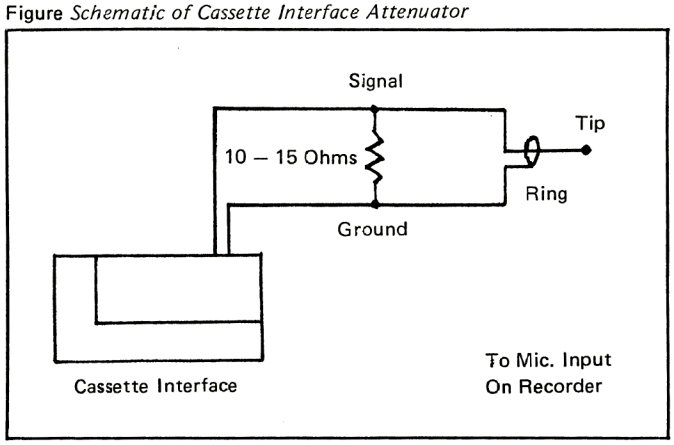
Peter Korda, % Price Systems, 6363 Sunset Boulevard, Suite 529, Hollywood, CA 90028, forwarded the following information for users of the Sharp PC-1211 and Radio Shack TRS-80 PCs.

If, after successfully performing a CSAVE operation to record a program on a cassette, you have not been able to load the program using CLOAD because the PC does not recognize the end of the program on the tape, you may have a problem with the record signal overloading the tape recorder.

After experimenting with a variety of different brands of cassette recorders, including those by Sony, Panasonic, JVC and Radio Shack, Peter believes the problem is caused by excessive amplitude from the computer interface to the recorder. The signal then overloads the automatic gain control of the cassette recorder. He suggests a simple solution to the problem. Connect a 10 to 15 ohm resistor between the signal line and the ground line of the output from the interface. Peter notes that the resistor, in addition to attenuating the signal, provides a load to the interface output which attenuates spurious noise spikes.

As indicated by the accompanying diagram, the resistor can be installed in a patch cord that runs between the red jack of the interface and the microphone input of the tape recorder. Fifteen minutes of effort and an 8-cent resistor might make PC recordings easier if you are experiencing this type of problem.

Figure *Schematic of Cassette Interface Attenuator*



DO YOU WANT AN INDEX?

We are considering putting an index for Issues 01 – 10 of *PCN* in the next issue. Would you like to see such an index or do you think it would be a waste of valuable space? Your opinion counts, so let us know if you feel an index is desirable. Hurry!

P.O. Box 232, Seymour, CT 06483

FROM THE WATCH POCKET

Would you believe about 250,000 PCs sold to date? That is the consensus these days. And now with Casio on board and others soon to join . . . .

Blanton Software Service offers a number of PC programs in addition to the one I reviewed elsewhere in this issue. All of their programs are optionally available on cassette. The prices generally range from $5 to $8. Write to the firm at the address given in the review for a current catalog. Of the programs I examined, I was favorably impressed with *Electronic Checkbook, Appointment Calendar, Countdown Timer/Clock/Alarm,* and the *Travel/Business Expenses* program. I was not impressed by Blanton's version of the card game *Blackjack.* Neither the display format nor speed of execution was to my liking. (In other words, I have seen better on a PC.) This is purely a subjective opinion. I saw nothing wrong with the technical execution of the program. All-in-all, I feel this is a software firm worth consideration if you are in the market for programs that can be supplied on cassettes.

If you are a beginner to the use of a PC and programming using the BASIC language, write to **XCEL,** *13763 Polk Street, Sylmar, CA 91342* and ask for information on their new tutorial *Beginner's Guide to Programming.* This consist of a book in combination with several packs of "program" and "task" cards. These have been integrated to form a do-it-yourself course in programming. The price is $19.00.

Another new outfit under the name **PersaSoft, Inc.,** *9609 S.W. Kelly, Portland, OR 97219,* has announced a line of software for the Sharp PC-1211/Radio Shack TRS-80 Pocket Computer. They have announced the availability of a package called *Beat-The-Market* that is aimed at stock market investors. Total price of the package on six cassettes is $75.00. Individual parts of the package are available separately. Other packages, including a series named *Creative Real Estate Financing* are reportedly under development. Write to the company for further information.

The September 22 issue of **Electronics** carries another pocket computer program by *Cass R. Lewart.* This one analyzes problems in classical queuing theory. Looks useful for engineers/scientists/statisticians. See page 157.

November **Interface Age** has *two* (!) articles related to PCs. One is the regular *Bob McElwain* column in which he presents an inventory estimating program. The other is an article by *Alan R. Miller* in which he introduces the printer for the Radio Shack TRS-80 PC. (Do you remember when *PCN* introduced the printer? See the difference between a newsletter and a magazine?) That same article presents a Shell-Metzner sorting routine for the PC. The significant point is that at least a magazine devoted two whole articles to PCs. Think they could be catching on?

Not to be left out of the field, **80 Microcomputing** has an article in the October issue that presents a nice three-part program. The first part finds the term of a loan. The second determines the periodic payment. The last section will determine the true annual rate of interest. This is a nicely written package by *Walter J. Atkins, Jr. Ph.D.* Nicely presented, too!

David Motto, whose review of the Casio FX-702P graces these pages, seems basically pleased with the new machine. He does note, however, in a recent communication, that the unit has failed to power-up correctly a number of times. This is cleared by recycling the ON-OFF switch. But, he has asked the firm for comment. Several other users have not mentioned the problem. The most common statement heard concerns satisfaction with the speed of the unit. Others have complained they cannot obtain the unit.

Try **Atlantic N.E. Marketing** if you are interested in a Casio. The phone number is (617) 639-0285.

Have you heard the rumor about Sharp Electronics running field trials of a 16K version of its PC? One international traveler is reported as actually seeing the unit – complete with a considerably enhanced printer that has multiple-color capability. Now a 16K unit would be nice. Yes, that would be nice.

Expect a surprise from *PCN* during November. I hope you like it.

– Nat Wadsworth, Editor